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An Illustrated Weekly Review of Mechanical Press of the World

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Smithsonian Institution

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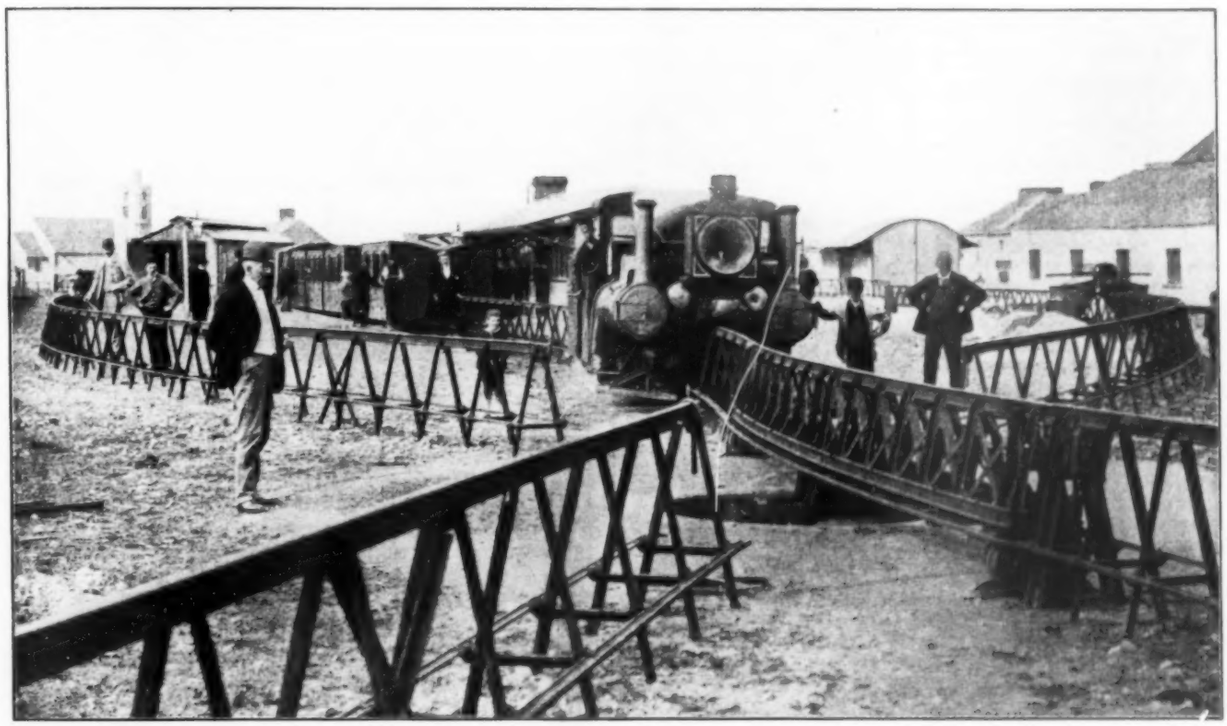
Single Rail Train May Revolutionize Speed



Eyes of the Engineering World Turned Toward England, Where a Railroad is Being Built for Trains to Run 110 Miles an Hour--Tests Already Successful

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Trains of the Future May Run on One Rail

The Traffic World's Attention is Turned Toward a Wonderful Railroad Being Built in England

Will the overland flyer of the future speed through the country on one rail instead of two? Has the double rail, to which we have so long been accustomed, been a hindrance rather than an aid to rapid and comfortable traffic? Does the railroad with single rail furnish the solution of the problems of speed and economical operation—problems that have engaged the minds of the greatest engineers of the world for a generation. All civilization is now turning its eyes to a test that is to be made with a single-rail line in England. Experiments, previous to beginning the construction, gave forth such amazing results as to place this system almost beyond the experimental stage. The success of these experiments has been so great as to induce the offer of unlimited capital and to cause the scientific world to wonder if railway construction of the past has all been based on the wrong principle. The single track train is an odd looking contrivance, but it is said that passengers glide along in the saddle-bag shaped cars with an ease of motion never before realized in railway traffic. It is expected to make a speed of 110 miles an hour.

The road is now being built, and will soon be in operation. It will extend from Manchester to Liverpool, and is patterned after the road which was operated at the Brussels exhibition in 1897, which was three miles long, and on which a speed of 83 miles an hour was frequently made. As this line was very crooked, it was not adapted to as high speed as the Manchester-Liverpool road, which has few curves.

The new system is known as the Behr Mono-Railway. The track is a single rail of the same shape and weight as generally used on steam roads. This rail is fastened at the top of an A-shaped structure made of steel. The structure is riveted to steel ties firmly imbedded in cement and rock ballast. The triangular supports for the rail are only 4 feet high, and one is placed every 3 feet 3 inches. At each side and 18 inches from the ground is placed a light guide rail to keep the moving car in position. The entire weight of the car rests upon large grooved wheels which travel upon the large rail at the top of the framework. As electric motors will be used to propel the train, each of these wheels will be made a "driver." Current is conducted on rails placed upon the ties, but insulated from them.

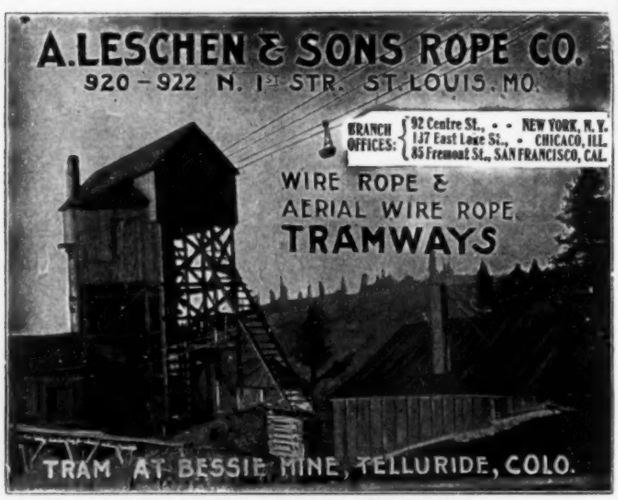
The cars consist of two compartments, one on each side of the structure, and are 60 feet long, weighing four tons each. They will seat 32 passengers, who will sit with their backs to the track. No stops will be made between Manchester and Liverpool, and it is expected to make the trip of 34 miles in 20 minutes, which is just one-half the best time now made by the steam road running between these cities. Two tracks will be provided, one for use in each direction, and only passengers, mail and light parcels will be carried. One million dollars has been spent in bringing the system to its present state of efficiency, for while the successful working of the idea is comparatively recent, the conception is not. On this point Page's Magazine, a notable English authority, says:

"The first idea of a single-rail railway dates back to one hundred years ago, and many such are now being used in various parts of the world. Perhaps the most interesting is the 'Lartigue' system; the idea was suggested to M. Lartigue, who was at the time manager of a company in Algeria, by the sight of a long line of camels with their saddle packs on either side.

"In his imagination the line of camels transformed itself into an elevated single-rail and the packs into passenger cars carried on each side of the rail. The plan was soon put into operation, and a line was built consisting of a main or carrying rail placed on the top of two trestles, to the apex of which the rail was bolted. The motive power was animal, and the line proved useful in carrying agricultural produce in deep sandy districts, where sand storms frequently covered the rails if laid on the ground in the usual way."

Mr. Behr took up the work in 1885, built a short experimental line in Ireland, which has been in operation since 1886, and later the Brussels road.

A speed of 100 miles an hour on the ordinary two-rail track of steam roads is only possible by having an almost perfectly straight track and a very heavy roadbed. Competent engineers have placed the necessary elevation of the outside rail on curves of a two-rail track at from 18 to 22 inches for a safe speed of 100 miles an hour. This elevation would be wholly impractical for trains moving at slow speed, as gravity would overcome their inertia and the cars would tip over.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MAKING STRAW HATS IN CUBA

Woven by Hand in Farm Houses Which are Shared by Pigs, Chickens and Dogs

Straw hats of excellent quality can be bought in Cuba at exceedingly low prices. The hats are made by hand, mostly by the women, while the men work in the fields or lounge about in the shade. Every Cuban residence in certain of the farming districts of the poor is a hat factory. Here girls in their teens toil throughout the day interweaving the straw into the form of tiles. Remarkable skill is possessed by some of these feminine hat-makers, but a remuneration of 30 cents a day is considered good returns for their labors. Cooking, eating and sleeping are often done in the same room where the hats are made.

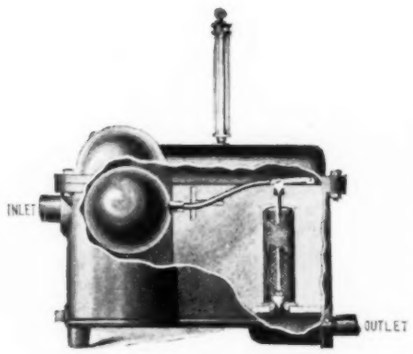
Making Hats in Cuba

Tropical Truth says: The farmhouse is a hut of one room with a lean-to for a kitchen, which is freely shared by pigs, chickens, cats, dogs and whatever other animals the farmer owns. The ponies and cattle have no shelter, and need none.

There were 19 transatlantic steamers in Portland, Me., on one day recently, discharging or waiting to be discharged. This is the largest number that ever assembled in this port at any one time.

Heats Whole Towns From Central Plant

Most Remarkable System in the World at Lockport, N. Y.—Plan Destined to Supplant Other Methods



Empire Steam Trap

Goodbye to the boiler and furnace and individual heating plant of the flat building; goodbye to the furnace-heated residence; to the gas and coal heaters and to the present system of heating hotels and office buildings. Instead of having the heating plant in the building the latest and the ideal method is to have the heated steam sent to the building through underground pipes from a central plant, which plant furnishes numerous other buildings with heat in the same manner. The time is probably not far distant when no building will be bothered with producing its own heat. Each town will have one great heating plant and from this the steam will be sent to all the residences and building houses through a system of pipes, just as gas is distributed now. The amount of heat used by each consumer will be measured by a meter, just as gas is measured.

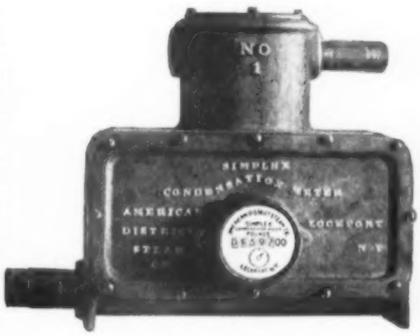
There is one town in the United States that is already thoroughly equipped with this system. It is Lockport, N. Y. The system is also installed in districts of many cities, so that one great plant heats all the houses, for blocks around. Other towns and districts are being equipped so rapidly that the method seems to presage a new era in our mode of keeping warm.

This idea of underground steam distribution was conceived by Birdsill Holly, the famous inventor to whom we are indebted for the pumping machinery for the direct distribution of water. Before his death he formed the Holly Steam Combination Company, which, in 1877, put his ideas of steam heat into effect in Lockport, N. Y., the town that now boasts of the most advanced system of heating in the world. The construction at first, however, was crude, and gave but poor success. But Lockport has served as the American field for experiments ever since and now the system seems to have reached perfection. The original company has been succeeded by the American District Steam Company, which has employed leading engineering minds of the country in perfecting the ideas originated by Birdsill Holly.

In the system of district steam heating the boiler house of the central station, which contains a battery of boilers, is located where fuel can be obtained at the least expense in handling. The cost of firing is reduced by automatic stokers and machinery for handling fuel. Full weight, strictly wrought iron pipe is used in conveying the steam to subscribers. The mains are often as large as 24 inches in diameter. Insulation is secured by covering the pipe with asbestos and enclosing all in a round tin-lined wood casing, having a shell of four inches with a dead air space of one inch between the tin and the asbestos covered pipe. The meter to determine the amount of steam used registers in pounds of water, and knowing the evaporative duty of fuel and its price, together with the cost of firing and other expenses, a basis is obtained for the proper charge to consumers.

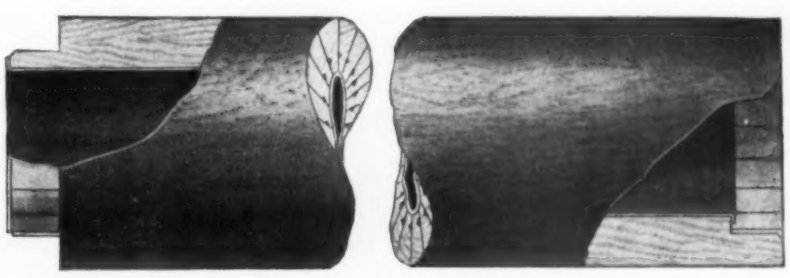
Where it is desirable to drip the street mains from condensation, the service connection is made from the bottom of the main, and is laid on a down grade to the building, where it is dripped through a separate trap into an economizing coil, and fully utilized.

The steam is led into the house by means of pipes, and radiators are employed as in the ordinary steam heating systems. A feature of the new system is that the main for returning water of condensation has been practically abandoned, because the water, after having been heated to high temperature, has a tendency to impair the pipes. Thus, instead of being returned, the water is either used for household purposes or let run into the drain. An economizing or cooling coil, itself not unlike a spiral radiator, is placed in each building. All the water of condensation is discharged into it from the steam trap. This coil serves as an indirect radiator for the purpose of ventilation and affords the customer the convenience of being able to stand over the incoming supply of heat. The water leaves the coil only a few degrees above the temperature of the air and can be used for laundry or domestic purposes.

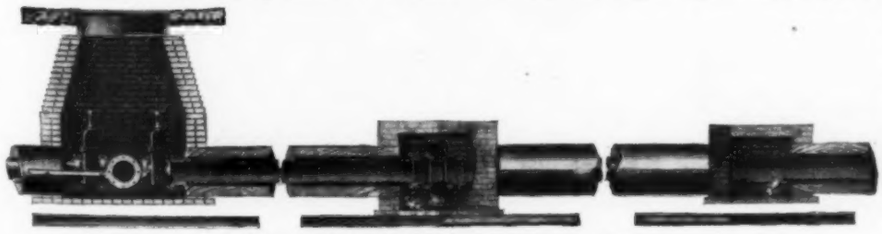


Meter for Measuring Heat

The new system produces increased cleanliness, because of the absence of coal, ashes and smoke about the building; increased safety from fire loss; a simple means always ready for heating water for baths, laundry and other purposes; a more even distribution of heat throughout the building than is obtained by the separate systems. There are no stationary firemen to pay; no boilers, coal bins, ash piles, etc., to take up space; no fires to build and look after



Steam Pipe Casing



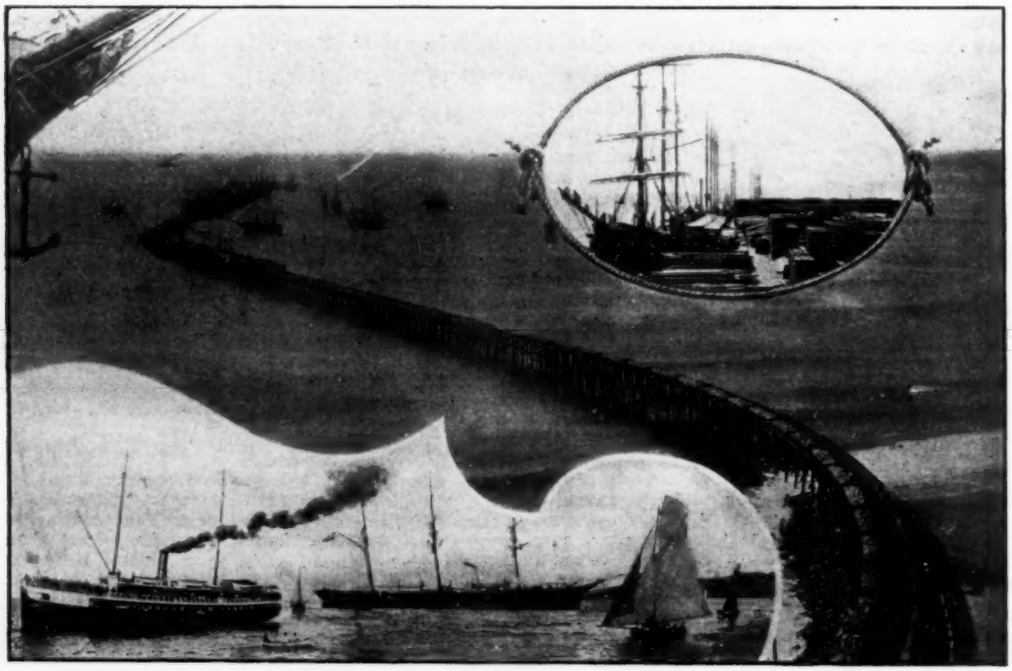
Showing Method of Distributing Heat Through District

SHAMROCK'S MARVELOUS MAST.

The hollow steel mast which has been made for Sir Thomas Lipton's new yacht, Shamrock III, is declared to be the most remarkable achievement in yacht construction in Great Britain. The workmen who built the spars for all three challengers say that the mast for the new boat is 1,500 pounds lighter than that of Shamrock II, while the whole spar is 1,800 pounds lighter than the lower mast of Shamrock I.

The workmen declare that they do not see how the steel shell is to withstand the enormous strain of a high wind, but they admit that the designer is apparently satisfied with the result.

Longest Pier in the World



Pier at Port Los Angeles, Cal.

America's Finest Breakwater

Port of Los Angeles Greatly Benefited by Costly Improvements at San Pedro

The finest breakwater in America, costing several million dollars, is nearing completion at San Pedro, the port of Los Angeles, Cal. Here is built the longest pier in the world. This will give Los Angeles a splendid harbor and will greatly add to the city's commercial growth. The breakwater, however, is only one of the numerous enterprises that are looming up in Los Angeles and making that city look like a future rival of San Francisco.

Enterprise, speaking for Los Angeles, says: When a city apparently surrounded by deserts and arid plains, with little or no rainfall, and situated 25 miles from navigable water, shows the greatest strides of any city in the country, then he at once concludes that credit is due not to nature, but to the energy and enterprise of her citizens, and his judgment is correct.

Here is a city of 125,000 people, with every evidence of the most striking and substantial progress. Her streets are well laid out and are being rapidly paved, considering that but few years ago the present southern metropolis was but a sleepy country town of one-third its present size. The buildings are of the finest type of modern structure. They are going up on every hand, yet one can rarely find an office vacant or a "To Let" sign displayed in the residence sections. One of the finest street-car services in the country can be seen in Los Angeles.

Ships Discharging Lumber at San Pedro

Automobile Climbs Lookout Mountain

Daring Feat to Test the Grade Climbing Possibilities of a Steam Propelled Vehicle

Climbing to the topmost point on Lookout Mountain in an automobile is one of the most daring of the recent efforts of automobilists to test the grade climbing possibilities of their machines. The feat was performed by a Locomobile, a steam propelled vehicle. The ascent of the mountain famed for its precipitous sides as well as for its historical associations was fraught with great danger, and the trip was replete with adventures that the ordinary individual would not care to encounter very often in a life time. At many points in the climb the slip of a wheel or the failure of the brake would have dashed all four of the 20th century mountain climbers to certain death. The machine performed its duties well, however, and safely bore them up and down the steep mountain side, without injury to the vehicle or its occupants.

The illustration shows the Locomobile as it halted on the very summit of the mountain with its passengers looking out over the vast expanse of picturesque country that can be viewed from the dizzy height.

Enormous Water Works Being Built in England

Dams and Reservoirs Costing $50,000,000 to Harness the Derwent's Floods and Supply Four Cities

Four cities of England—Nottingham, Leicester, Derby and Sheffield—have united in the construction of an immense waterworks system that will cost $50,000,000. From the natural watershed embraced in the valley of the river Derwent the supply is to be obtained. Five great reservoirs and five dams are now being built to harness the waters. The annual rainfall in the valley, 50 inches per annum, will yield for storage 50,000,000 gallons per day. The five reservoirs will each have a storage capacity of from 1,886,000,000 gallons to 2,160,000,000 gallons. The dams will be from 95 to 136 feet high and from 980 to 1,950 feet long. They will need 2,000,000 tons of stone, and quarries covering 52 acres were bought in the neighborhood. A railroad 7 miles long, as well constructed as a passenger line, has been built for present and future use in connection with the reservoirs. A town has been built especially to house the army of workmen that will be employed for at least a dozen years. Dwellings are provided for married men and their families, as well as for single men. The houses are of galvanized iron lined with matched boards. The waterworks are 10 miles from Sheffield, 30 miles from Derby, 35 miles from Nottingham and 50 miles from Leicester.

A WALKING HARDWARE STORE

Claude Trimble, 24 years old, a "human ostrich," walked into Erie County Hospital, Buffalo, recently and asked for medical attention. After the operation had been successfully performed the surgeons had taken from Trimble's stomach 453 carpet tacks, 42 penknife blades, 142 screws, 40 pen points, 6 1-3 ounces of ground glass, and a wire chain three inches long. Trimble formerly traveled with a circus and was a tack eater.

WHAT HE SAW IN A STREET CAR

I saw a woman in a street car open a satchel and take out a purse, close the satchel and open the purse, take out a dime and close the purse, open the satchel and put in the purse, close the satchel and lock both ends. Then she gave the dime to the conductor and took a nickel in exchange. Then she opened the satchel, took out the purse, closed the satchel and opened the purse, put in the nickel and closed the purse, opened the satchel and put in the purse, closed the satchel and locked both ends. Then she felt to see if her back hair was all right, and it was all right, and she was all right, and just as sweet! That was a woman.

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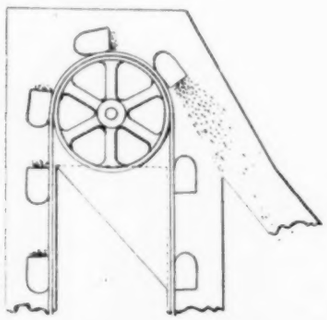
ELEVATOR HEADS AND BOOTS.

Many fires in grain elevators and flour mills have been traced to defects in elevator heads, says the Grain Dealers' Journal. These have been, to a large extent, eradicated in the modern grain elevator; first, by removing the old fashioned solid wooden pulley; second, by hoppering or making a slanting strut board under the head pulley.

The elevator stands on the first floor or basement, and is practically independent of the building. The head pulley and its shaft are fastened to the frame work of Texas or top of building. While the elevator legging stands solid, the pulleys and shaft are subject to the settling of the building, as is frequently in evidence by the wear of the shaft on sides of elevator head. With a horizontal strut board under the pulley, though built with one or more inches clear space, the pulley finally settles into contact, causing friction. Besides the full cups overflow, and the grain caught by the flat board packs under the pulley, making a fire hazard and loss of power. It also makes a good resting place for insects to breed.

The cut given herewith illustrates a correction by cutting out the horizontal board and down leg, and substituting a slanting board at an angle of 45 degrees with proper side pieces.



The solid wooden pulley would not be considered by anyone today, yet many are inclined to use split pulleys. There is no fire hazard greater than the friction of wood against wood. This will result when the shaft and its pulley are out of alignment or the elevator leg and head out of plumb. The insurance companies who study fire hazards to reduce the insurance cost, will not consider risks having these pulleys in heads or boots. The wood split pulley has many desirable features and uses, but not for service in the concealed, inaccessible elevator heads and boots.

CHINAMEN LIVE BACKWARDS.

In Japan horses are backed into their stalls, then a door at the entrance to the stall is closed. The door has a feed box and hay rack conveniently attached.

But China is the land of queer doings, says the Harness Review. In China the left hand is the place of honor. The Chinaman rides with his heels instead of his toes in the stirrups. He carries a pig instead of driving him. He whitens instead of blackens his shoes. His favorite present to a parent is a coffin. He keeps out of step in walking with others. He shakes his own hands instead of his friends. He puts on his hat in salutation when we take it off. He deems it polite to ask a casual caller's age and income. His women folk are often seen in trousers accompanied by men in gowns. A Chinaman's given name comes after, not before, "his honored family name." His compass points south, and he speaks of westnorth instead of northwest. He does not consider it clumsy, but courteous, to take both hands to offer a cup of tea.

And he says of us and our customs, as we may say of him and his, "Oh, how queer."

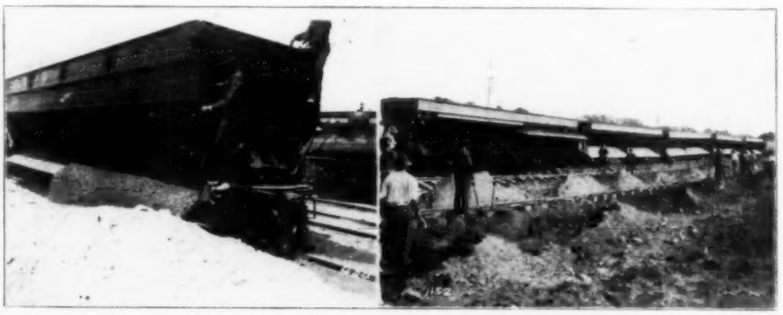
One Man Unloads Train while it Moves

Dumping Cars Work Wonderful Changes in Conditions

It used to be that a large force of men, armed with shovels, was required to unload one car of ballast or coal, while the car stood motionless for hours on a side track. Now one man can unload a whole train of cars without the train stopping. Such is the progress Americans are making in the economy of time and labor. This particular great labor-saving method is made possible by the Goodwin car, which is to its kind of traffic what the Pullman car is to passenger traffic. That is, the Goodwin is the highest class car for handling dumpable materials, insuring the greatest convenience, safety and expediency. The cars are generally made of steel, as all freight cars will be after a while. It carries its load in the hollow caused by the intersection of two inclined planes. In discharging the car, one or both of these inclined planes is removed. As a consequence the load slides down and out. The discharging apparatus is worked by the air brake system of the train, as well as by hand, and any number of cars may be discharged at a single operation. To discharge more than one car at a time by one operator, the cars are coupled together with their special automatic air couplers. In this way the train may be unloaded by the operator while running. The cars are built to carry and discharge all kinds of way freight and general merchandise from fine loose materials to bulky materials like pig iron, billets, large rock, heavy castings, hot cinders, etc.

Entire Train of Goodwin Cars Being Discharged Simultaneously with One Man at the Air Discharging Valves—Train Going at 12 Miles an Hour.

Goodwin Cars on Great Northern Railroad Discharging Rock—Train Going at Speed of 16 Miles an Hour.



Ballasting with Ashes—Restricted Opening—Train Running 15 Miles an Hour

Making Roadbed from Material Dumped from Train of Goodwin Cars.

THE LIGHTNING CALCULATOR'S ADDITION.

There are experts who can add very rapidly, but the best of them cannot add up a column of *ones* any faster than you can, says the Draftsman.

Here is how some of the "rapid addition" is worked. The "professor" writes a line of figures, then another, and so on.

2345621
7654379
2598432
7401568
2132142
3121421

25253563

The second line, however, added to the first makes *nines*, except at the extreme right, where the two figures add to *ten*. The third and fourth bear the same relation, and as many more as he chooses to put down.

THE WAR CAMEL IN SOMALILAND.

Numbers of the Valuable Beasts Drowned in Getting Them Ashore.

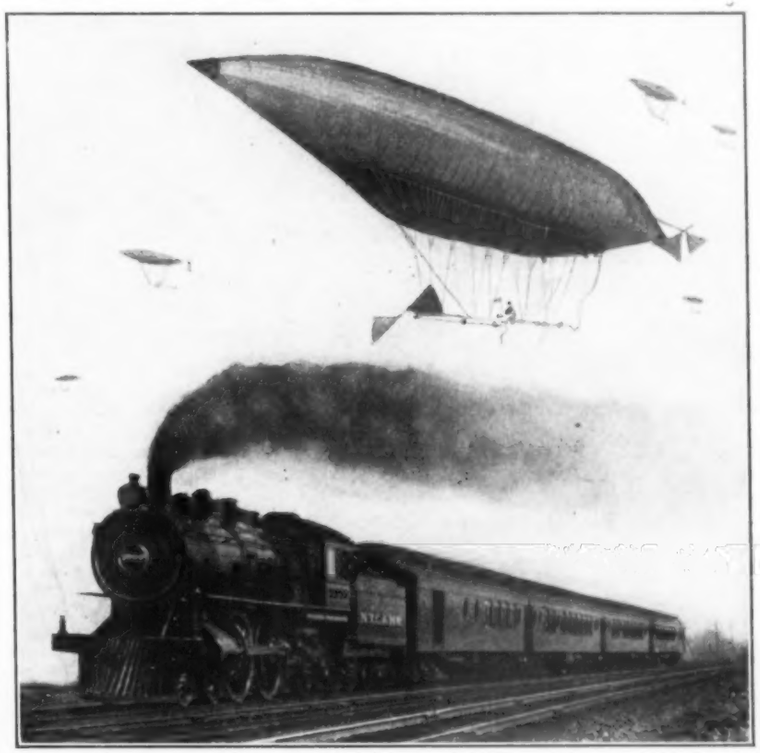
In preparing for the advance on Somaliland the British transported large numbers of camels to the semi-desert land. The Bikanir camel corps was organized and is now considered one of the most formidable military forces in the world for the use for which it is designed. The camel which rarely requires food or drink will carry the trooper and sufficient provisions to last him a month. Many of the camels on this expedition were lost by drowning. The illustration shows the unloading of a war camel at Obbia. The camel is trussed and slung over the ship's side into a surf boat. The ropes are then loosed, the boat is upset and the camel is compelled to swim ashore. The camel is not as much at home in the water as he is on the desert and hence large numbers of them perished before reaching shore.

Landing a War Camel in the Surf at Obbia—With the Somaliland Expedition—Photos by a British Officer.

Airship Versus Passenger Engine

World's Fastest Train Would Race Across the Continent With Swiftest of Aerial Craft

An airship race from New York to St. Louis during the coming world's fair has been proposed by a New York aeronaut. This, it is claimed, would give the entire country lying on the route between the two cities an opportunity of witnessing the ships in flight and would prove the most sensational race in history. Of course there is no airship at present that would undertake the long journey, but Santos Dumont claims that he will have a craft in readiness by the time of the world's fair that can safely fly across the American continent. The same claim is made by Prof. Stanley, who is building the monster aluminum airship in San Francisco, and by a Chicago aeronaut.



Imaginary Race Between the World's Fastest Train and a Fleet of Airships—Copyrighted 1902 by George H. Daniels, Gen'l Passenger Agent New York Central.

While some of the inventors say that their ships will be able to double the speed of a passenger train in the race, the New York Central officials say they have no fears of anything that flies, walks or rolls, making better time than the 20th Century Limited, the fastest long-distance train in the world. The suggestion has been made to enter the "Limited" in the race, should it materialize. The accompanying illustration shows the relative position of the racers as they would appear at the end of the fifth mile, according to the calculations of railway engineers, who claim they have made due allowance for the increased speed capacity that may be attained by the new air ships yet to be built. The train leading the racers is the famous 20th Century Limited; pressing close behind is Santos Dumont's airship being propelled by the renowned aeronaut. Next in order is Spencer's aerial craft; next Stanley's and others are "also rans." Of course this all comes from the fanciful dreams of railway officials; but things that looked stranger than this vagary have come true, and it may be that scenes like the one shown in the illustration will become familiar sights to persons even now living. Sending a message across the ocean in a second's time; talking across the continent, and telegraphing without wires would have been considered miracles a few years ago. Hence the race between airships and train may not be an impossibility.

BATTLE OF THE COWS.

Switzerland's annual "battle of cows" has just been fought to a finish near the little town of Arolla, in Canton Valaise. This extraordinary battle takes place every season when the Swiss cattle which come from all parts leave the valleys near Arolla in a great herd to feed on the mountain sides. The object of the conflict is to decide which cow shall be queen. This latest fight was seen by a party of greatly excited English tourists. They watched the herd of cows which covered a space of 500 yards, fight fiercely, and saw each cow as soon as she had been beaten, led off the "field." When evening came the only occupants of the improvised arena were about a dozen unconquered cows, which paced the turf proudly. Then the queen of last year was let into the field. One by one the other cows were permitted to advance against her and one by one she put them out of business

Easy Electrical Experiments

By L. P. Dickinson

HOW TO MAKE AN ELECTRIC LOCOMOTIVE.

Any ingenious boy can readily construct a model electric locomotive which will be the source of much pleasure and instruction as well.

The main outlines of the motor to be used are shown in the accompanying figure. It consists of three main parts, the field magnet M, the field coils H, and the armature A. The

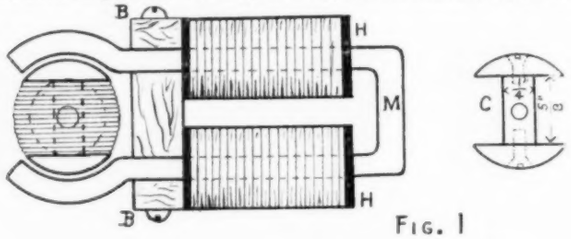
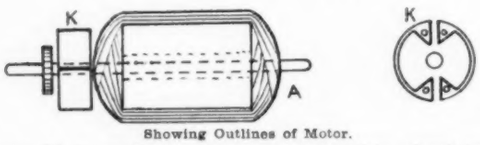


FIG. 1



Showing Outlines of Motor.

field magnet M is made up from strips of thin sheet iron, such as may be bought at any stove dealers. This iron is cut into strips about 9 inches long and 1⅛ inches wide, and about eight strips of this size will be required. In order to bend these strips into the shape shown in the figure, it is best to make a wooden form the shape of which is exactly the shape of the interior space between the limbs of the magnet. This space is circular at one end as shown and the diameter of this circular space is 1⅛ inches. The length of the interior straight portions is 2¼ inches. Clamp the wooden form in a vise and bend the iron strips around it one at a time, until they all conform exactly to the shape shown in the figure. Provide blocks of wood shown at B, of which the upper is 2¼ inches long, the middle one being of the same length, and the lower one being 3½ inches long. By means of brass screws passing from the upper and lower blocks into the middle block, the strips of iron may be tightly squeezed together into a solid mass.

The field coils shown at H are 1½ inches long and surround the iron core to a depth of ¼ inch. It is best to make up a small form from thin sheet brass or copper which shall have the dimensions of the finished coil, and upon which the field coils may be wound and afterwards slipped into place. If this is done, however, the coils must be finished and slipped on before the circular space at the end of the magnet is formed. The wire used should be No. 24 double cotton covered, and about 4 ounces will be required. Be very careful to insulate all metal parts by covering them with a layer of paper before winding on the wire. The coils are connected in series in the ordinary manner.

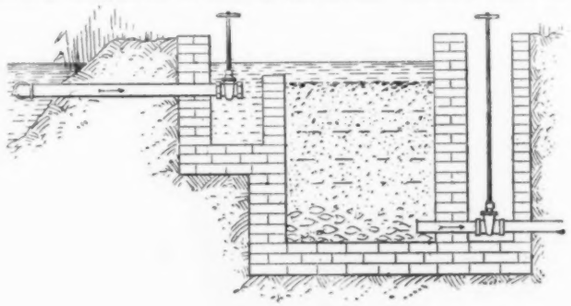
Passing now to the armature, we come to a more difficult matter. The shape of the iron part of the armature is shown at C. It consists of three parts—a rectangular central portion ¼ inch thick, ⅞ inch long and ⅝ inch wide. To the narrow faces of this block are to be fastened the two circular end portions, by means of flat-head iron screws passing through the outer pieces into the central block. These circular pieces of iron should be of such dimensions that when bolted together the armature should have an outside diameter of exactly 1 inch, and the length of these outer sections is 1¼ inches. Thus an iron core will be formed whose length is 1¼ inches, whose diameter is 1 inch and which has a groove ⅝ inch wide running lengthwise around the core. In the exact center bore a hole lengthwise through the core, ⅛ inch in diameter. Into this drive tightly a shaft 2¾ inches in length and perfectly straight. Now wind the slot in the armature core full of No. 24 magnet wire carefully insulated from the iron core.

A commutator must now be made, shown at K, and consisting of a circular hardwood block ⅝ inch in diameter and 5-16 inch thick, on the outer surface of which are fastened two semi-circular pieces of thin copper. The method of fastening these is shown in the small figure at the right. The pieces of copper may be cut from any thin sheet, with the little tongues projecting as shown in the figure. The pieces of copper may then be bent into circular form so as to fit closely the wooden block, and may be fastened to the latter by bending the tongues down over the ends of the block, and secured by a pin driven through the tongues into the block. The block has a hole in the center just large enough so that it will fit very snugly upon the shaft when put into the position shown in the figure. Care must be taken that the two sections of the commutator do not touch each other, nor the iron shaft of the motor. The slot should be in the position shown—that is, at right angles to the groove on the iron part of the armature. Outside the commutator and separated therefrom is driven on a small gear wheel taken from an old clock. Each end of the armature winding is connected to one of the sections of the commutator.

It will be noticed that no bearings or supports for the armature are described, as this will be left for a following chapter.

HOW TO BUILD A SAND FILTER.

A sand filter is easily made, and its effectiveness as a strainer cannot be doubted, and for water drawn from a pond and a small stream a good strainer is all that is needed. In constructing a sand filter some of the details observed in making water companies' filter beds can be copied with advantage. In a modern instance the top layer of the bed consists of fine washed sand, 2 feet 6 inches thick; this rests on 3 inches of pea gravel, and below layers follow in this order—3 inches of ½-inch gravel, 4 inches of 1-inch gravel and 9 inches of rough stones. These layers must be washed, and the 9-inch work forms the bottom layer of all. At the bottom of the bed there should be a perforated pipe by which the filtered water passes away to the storage. For small filters an open end pipe will serve every purpose. The water should be allowed to flow onto the top of the sand and soak through, and the purpose of the different grades of the gravel beneath the sand is merely to form a support for the sand and prevent it being washed into the delivery pipe. The accompanying illustration from the Metal Worker shows the arrangement. The space where the water first enters is not always provided, but it is desirable, as it serves as a settling tank for heavy impurities held in supension, and it prevents the water washing roughly onto the surface of the sand and distributing it. Its use is, however, quite optional. The level of the water in the filter should be the same as that in the pond, and the water passes by gravity to the storage tank and has the same level there. This, at least, is the arrangement which should be obtained if possible in order to obviate the use of float valves or similar devices designated to control the levels. When all are on a



Sand Filter.

level the movement of water through the filter is very quiet and the filtering most effective.

A filter constructed in the manner shown, and with the depth of sand stated, will pass 350 gallons of water per square yard each 24 hours.

The Mechanical Review says: The opening up of the new route between England and Australia, via the Great Siberian Railway and steamer connection between Port Arthur and Port Darwin will do for Northern Australia what the American and Canadian transcontinentals have already so successfully accomplished for California and British Columbia.

Because of the decline of the shipbuilding industry in England there are now 7,000 shipbuilders out of work in that country.

WONDROUS STRENGTH OF EGG SHELL

First Information of the Enormous Pressure It Is Capable of Withstanding.

The first information given to the world of the actual enormous strength of the egg shell is furnished by Prof. Albert E. Guy, according to an article by him in the American Machinist, which is productive of some remarkable revelations. Through an ingenious process the tests were made on a number of eggs to determine the internal and external pressure they were capable of withstanding. The tests showed, said Mr. Guy, that the average shell was able to withstand an internal pressure of slightly more than 48 pounds to the square inch, before fracturing. One shell did not fail until the pressure rose to 65 pounds to the square inch and two others did not fracture until a pressure of 60 pounds was attained. In testing the resistance of the shell to external pressure it was found that the average hydrostatic pressure that produced failure was 550 pounds to the square inch. Two shells collapsed at 675 pounds to the square inch, one at 625 pounds and the smallest observed collapsing pressure was 400 pounds to the square inch.

LAUNDERING IN HOSPITALS.

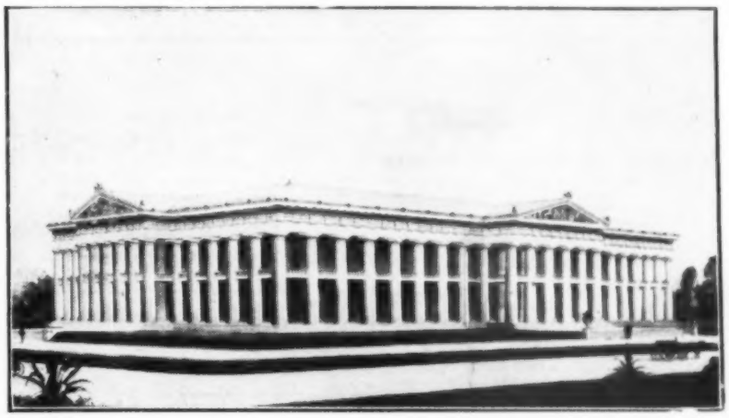
Places Where Clean and Germless Linen is a Requisite.

A first-class laundry with all modern machinery is now considered one of the first requisites of a well-equipped hospital. No longer is the linen of hospitals sent outside; the hospital has its own laundry where hygienic methods are strictly observed. There is no place where clean linen is so imperative or where so much of it is required as in a large hospital. It must be not only clean to the eye, but clean to the microscope; germless and sterile. One of the best equipped hospital laundries in the country is that of the Chicago Homeopathic Hospital, shown in the accompanying illustration.

Cleaning Clothes for the Sick.

The first fire boat, designed exclusively for fire service was built in London by Shand & Mason in 1859.

Fraternities to Build Great Temple



THE TEMPLE OF FRATERNITY at the Louisiana Purchase Exposition will represent the combined efforts of all the fraternal societies of the United States, this being the first time they have ever united in such an enterprise. Here the Masons, Odd Fellows, Knights of Pythias and all other orders will be assembled under one great roof as a big family. All rivalry and enmity will be forgotten. The building is being erected under the auspices of the Missouri Fraternal congress. It will be an adaptation of the famous Parthenon of Athens, the standard of Greek architecture. Immense Doric columns will surround the mansion on all its four sides, enclosing 16-foot verandas, which will surround the building on both the ground and second floors.

There will be a free dispensary for the sick, both men and women, under a medical commission; a branch postoffice, telephone service, check rooms, writing, reading, smoking and lounging rooms, ladies' parlors, and in fact, every convenience which will insure the comfort and enjoyment of members of the fraternal societies visiting the World's Fair.

KEEPS ROCKING CHAIRS FROM TRAVELING.

Editor Popular Mechanics: In a recent issue in an article entitled "Hints to Inventors," you say a large furniture manufacturer would like to know the cause of a rocking chair traveling and how to prevent it. The cause of its traveling is gravitation maintaining its equilibrium. The preventative corrugated rubber tires about one-half inch thick.

If the above is too thick to sift well I can readily thin it out.

G. A. ROTH.
89 Hobbie street, Chicago.

The National Fireman's Association convention will be held in Chicago in September on the week of the 100th anniversary of the founding of the city.

GUNS OF THE CIVIL WAR.

By Capt. Charles C. Jamieson, Ordinance Department, U. S. A.

The guns in use during the Civil war were low power, smooth bore guns, firing spherical cast iron shot and shell at low velocities, about one-third of that obtained by modern guns. The armor of the period was simple wrought iron, but this was amply sufficient to prevent penetration, yielding only by the racking and breaking of the bolts after continued pounding. With the changes from smooth bore to rifled guns and from spherical to elongated projectiles of cast iron with chilled points, penetration was complete. It then became necessary to provide a harder surface for the armor and the result was the compound armor with its steel face welded by special processes to a wrought iron back. When this armor was struck by the projectiles of the period, they were broken into fragments against its face, but, due to different elasticity of the metals in the armor, the steel bended to separate from the backing, and continued firing resulted in the breaking of the face exposing the easily perforated wrought iron back.

MORE ABOUT THE PIONEER B. & O. ENGINE.

Editor Popular Mechanics: Since sending you the cut of the old B. & O. engine, No. 207, I have found these facts in regard to her: This was one of the celebrated Globe eight-wheeled, inside connected engines, that were in general use on New England roads for many years. She was built for the B. & O. road in 1854. Cylinders, 15x22 in.; drivers, 60 in.; boiler, 44 in. diameter, and weight, 56,000 lbs.

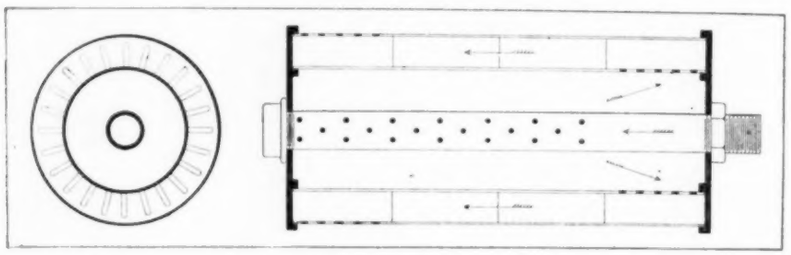
On the trial trip of the De Witt Clinton, in 1831, when Mr. Matthew was engineer, wood was burned for fuel.

James M. Kimball, Woburn, Mass.

SHOP NOTES

MUFFLER FOR GAS ENGINE.

Here is a new type of muffler for gasoline motors that is the result of a great deal of experimenting by C. R. Sutton of Waynesville, O., who thus describes the device in the Motor Age: The muffler is simple and cheap to construct and gives high efficiency with very small back pressure. I arranged a cut-out in



Sutton's Muffler.

the exhaust pipe of my motor that I might determine the effect of the muffler upon the engine, with the following results: The engine running at 1,250 revolutions per minute, with the muffler on, made 1,278 when cut out; 1,820 on, 1,861 out; 2,760 on, 2872 out—which I consider a very good record.

The muffler is composed of three shells having brass heads. Two shells are made of sheet iron. The exhaust enters the muffler through the central pipe, which has a number of small holes its entire length, increasing in size near the opposite end. The second chamber has a row of holes around the first end only. The outer shell has its openings at the outer end. Riveted to the outer shell are three sets of vibrators, which are made from sheet steel, cut like the teeth of a comb and extending inward almost to the middle shell. These aid in breaking up the sound waves, materially reducing the disagreeable noise of the exhaust.

EFFICIENCY OF BOILER JOINTS.

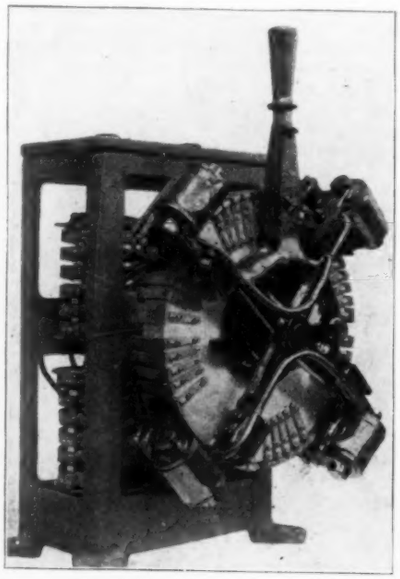
It is well known that the weakest part of a steam boiler shell is the longitudinal seam. This cannot be made as strong as the solid plate with any riveted construction, but a good design of joint employing multiple rows of rivets and cover plates may closely approximate to it. The horizontal tubular boilers, having quadruple riveted longitudinal seams, are calculated to have not less than 94 per cent of the strength of the solid plate. Mr. S. Vauclain of the Baldwin Locomotive Works, has recently presented a design of boiler joint which is calculated to have an efficiency of 96 per cent. The weakening of the shell depends on how much of the material is cut away by the rivet holes; the smaller the holes the less it is weakened. This fact may make the nickel steel rivets advisable in boiler construction where a high steam efficiency is necessary. The engineer of tests at the Bethlehem Steel Co. has demonstrated that a nickel rivet ¾ inch in diameter is as effective as a 1⅛ inch rivet made of common steel.

TO PREVENT VIBRATION.

The Architects' and Builders' Magazine quotes a speaker at a recent American Institute meeting, who gives a successful expedient adopted in insulating dynamos on sand. Beds of dry sand about 6 inches thick, placed under and in corresponding upright enclosures on all sides, were found to be nearly complete safeguards against the building partaking of any tremulous motion from the rapidly whirling machinery.

REGULATING AND REVERSING CONTROLLER FOR DIRECT CURRENT MOTORS.

For the control of D. C. motors operating cranes, hoists, etc., and similar appliances requiring variations in speed and frequent stops and reversals, the West-



Improved Controller.

inghouse Electric & Mfg. Co. has placed upon the market an improved controller of the commutator type which has been designed especially for this class of work. The necessary resistance is mounted inside of a cast-iron frame, on the outside of which is attached the commutator, or contact dial, for regulating the amount of resistance in circuit and for reversing the motor.

In the smaller sizes the resistance is of the ventilated cell type as shown in cut. The brush-holder is fitted with four contact arms, which, when the circuit is opened, divide the arc into four breaks. Each contact arm is provided with a powerful blow-out magnet which reduces the arcing to a minimum and makes the maintenance of an arc impossible.

HOW WHITE ENAMEL LETTERS ARE MADE.

The method of making an enameled letter has four stages, says the Decorators' Gazette and Plumbers' Review of London—stamping, enameling, firing and filing. The stamping is accomplished by means of presses, and is a very rapid and complete operation, the workman taking a piece of thin sheet copper, placing it on the press; when the lever descends there is a sharp cutting sound, and the letter is made perfect in every way. The letters are now taken and laid on a tray of wire, the hollow side being placed uppermost, and painted over with a thin mordant. While in this position, and before the mordant dries, they are taken on the tray to a large box, which is full of the powdered enamel, and holding the tray in one hand, the workman takes a fine sieve full of the powder falling through the open wire work and into the bin again, so that there is no waste. The letters are then taken and laid carefully on thin iron disks or plates on the bench, where they remain till they are fired. The disk containing the enameled letters is taken at the end of a long iron handle and carefully placed in a dome shaped muffle. These muffles are all heated from the outside—that is, the fire is all around the chamber, but not in it, the fumes of sulphur being destructive to the enamel if they are allowed to come in contact with it. So intense is the heat, however, that a muffle lasts only about nine days, and at the end of that time has to be renewed. After the enamel is fused on the copper the disk is taken out and placed on a side slab, where it is left to cool. This process is repeated on the front side of the letter, when all that remains to complete it is the filing. This is done with very fine files, and the letters are turned out smooth and well finished in every respect.

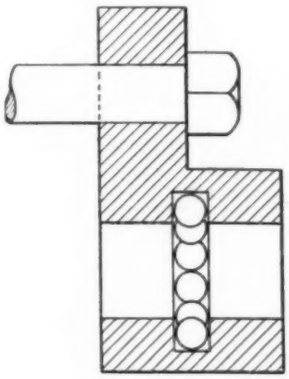
SCREW PROPELLER CALCULATOR.

A compound circular slide-rule, specially designed for facilitating the computation of the elements of a screw propeller, has recently been devised by George R. McDermott, Professor of Naval Architecture at Cornell University. The different scales with which the instrument is provided, have been laid down from formulae based on Froude's researches. Having as data any two of the four variables involved in the design of the propeller, the other two are immediately given by means of the rule. Thus, having given the diameter and efficiency of a proposed propeller, the computer gives immediately the revolutions and pitch ratio. The instrument is accompanied by a short treatise on the "Design of Screw Propellers," which forms a capital resume of the present state of the theory.

DEVICE TO PREVENT ENGINES FROM RACING.

The chief engineer of an electric railway tells in the Street Railway Review how he cured his two compound engines of racing. He says:

Upon taking charge of this station,



Ball Bearing for Governor Rod.

which contains two cross compound engines, size 14 and 28 x 36 in., I found they were regulating very badly, and after thoroughly overhauling all working parts and finding no serious defect, I started to experiment upon lines of my own. There is a 1¼ inch rod running between the high and low pressure guide frames, one end of which is connected to the governor mechanism and the other to the low pressure cut-off, as is customary in cross compound engines. Upon this I placed a counter balance in such a way that the governor should be assisted in its ascent and also to steady it, which proved to be a great advantage. A short time after, I removed the bearings at each end of the road, and turned a groove in them, introducing steel balls such as are used in bicycle ball bearings, practically making ball bearings of them, this completing the job. I have now two very

Counterweighted Governor Rod.

satisfactorily working engines at least 50 per cent better than formerly.

FUMES FROM GASOLINE MOTOR DANGEROUS.

The fumes or gases thrown out through the muffler of a gasoline engine are extremely dangerous if inhaled in considerable quantities. The Car, of London, relates the experience of a man who conducted a series of tests in a closed motor house. In an hour he experienced strange sensations and started to take a ride on his bicycle in the open air. In a few minutes he became dizzy and fainted, and did not recover from the effects for two days. The exhaust from a gasoline motor is largely carbonic acid gas and carbon monoxide. The first condition is found in poorly ventilated heaters or buildings where the oxygen of the air is converted into carbonic acid gas by the breathing of the occupants. Carbon monoxide is the terribly poisonous agent in water gas. The mixing of the two, as in the exhaust from the gasoline motor, produce a combination which is dangerous to inhale in any considerable quantity.

Wizard Top

Performs three times the number of tricks that we illustrate here. See how many you can originate. We are soon to offer a prize for the greatest number of tricks.

Patented April 22d, 1902.

EVERY position illustrated on this page is attained with absolute certainty, if our instructions are observed.

FIRST: Be sure to obtain considerable speed. Then place the top in desired position, centrally on the pedestal, **LETTING GO QUICKLY.** The idea is to get your hand out of the way that you may not interfere with the top's gyrations.

The top will hold its equilibrium at any angle, providing the inner top is revolving at high rate of speed.

It will spin on your finger, in your pocket, on either end or anywhere you place it.

A very amusing trick with this top is to put it in motion, place it on the floor or table with top end downward, as shown in this

cut, leave it lie for a few seconds until the spindle touches the table or floor, when it will jump up unassisted and spin on its head.

This top has a record of twelve minutes and forty seconds. Its average spin is about eight minutes on a plate or saucer. Time it!

When the top gives forth a screaching sound, a drop of oil should be applied to the spindle where it projects through the knob.

When in need of new cord, procure ordinary top cord, same as that which accompanies the top. A piece of fish line waxed a very little with shoemaker's wax will serve best.

Price Postpaid 25 Cents.

LOS GATOS NOVELTY CO.

604 Journal Bldg. - - Chicago, Ill.

Please inform me through your columns, or otherwise, where I can procure a small motor suitable for a model flying machine. I would like about one-eighth horsepower and to weigh about eight pounds; also where I can find sheet aluminum.—John Q. Adams, 301 First ave., Cedar Rapids, Ia.

Ans.—Motor for flying machine can be had of the Aeronautical World, Glenville, O.

Where can I get a complete set of castings and fixtures to make an automobile? —Box 314, Columbus Grove, O.

Ans.—Address W. Hoffman Motor Works, 1253 North Halsted street, Chicago.

HIGH SPEED OF TURBINES.

The high speeds at which steam turbines must necessarily run render them eminently suitable for direct attachment to dynamos. The speed to be adopted for the record-size turbines in the Chelsea station of the Underground Electric Railway Company of London, is now given at 1,000 revolutions per minute instead of 750 as originally proposed. The tests of the turbines recently started at Elberfeld, Germany, show a steam consumption equivalent to about 11 pounds per indicated horse power. This is probably an unparalleled preformance in economy. It is expected that the still larger sizes at the Chelsea station will do even better. Mr. Rankin Kennedy, in his new work on electrical installations, is very sanguine about the future of the turbine and he cannot decide whether it or the gas engine is to be the more economical motor. The drawback at present is that the turbine is protected by patents; but if a large demand arises it will probably be possible to arrange for manufacture under royalties; and then a time will come when the patents expire.

The Lackawanna Steel company of Buffalo, N. Y., is having built four 2,000 horse power gas-blowing engines, from German designs.

HERE'S YOUR CHANCE

$7.50 will buy 50 shares of stock in the Feather River Consolidated Mining Co., FULL PAID NON-ASSESSABLE — 50.00 Par value

This block of stock will look cheap at $25 within a short time and ought to be **WORTH $250 AND PAY BIG DIVIDENDS** when mill is completed. Mine is located on the famous Feather River, in Plumas County, California. Experts say there is now over $2,300,000 gold ore in sight ready for the mill. Money needed for mill and machinery and those who buy stock now to help pay for this will reap the largest profits. Get in on the ground floor now while you can. Don't wait till the stock gets out of reach. $75 buys 500 shares, par value, $500. Monthly payments if desired. Write for F. R prospectus. Map and Engineer's Reports. Booklet, "How to Judge Mining Stocks" free.

UNION SECURITY CO.
461 Gaff Bldg., Chicago, Ill.

Gold Plating Plant for $2.00

Simple and easily managed; blue vitriol battery; yields constant current; inexpensive; dispenses with the use of corrosive acids, etc.; may be used for years; supplies easily obtained. PLANT, with Gold, $2.00; with Silver or Nickel, $1.50; with Gold, Silver and Nickel, $3.00. Thoroughly practical; the best small plating outfit devised; anyone can operate it. Full instructions with every one. (Patent applied for.) Additional Supplies of Plating Chemicals mailed, per package, Gold, $1.00; Silver, 75c; Nickel, 50c.
HENRY FAULSON & CO.,
Jewelers' Supplies, 103 State St., Chicago.

FOR HOME STUDY
Electricity
This book gives you a complete course in 276 pages, 95 diagrams and illustrations, 20 tables and complete system of questions and answers. Gives practical working knowledge of electricity in all its branches. Good clear print, well bound, sent for $1 50. Address ELECTRICITY,
In care of Popular Mechanics,
Journal Bldg., Chicago.

Lambert Typewriter
$20—Complete With Case—$20

Typewriting revolutionized. Is superior to any other typewriter in all essential points. Beauty of writing, speed, uniformity of alignment, ease in operation, portability and constant readiness for work.
It won't do your thinks but it will make your thoughts look brighter. To see it is a revelation: to use it is a vacation. Full demonstration free. Inspection invited.

Lambert Typewriter Company
1274 Broadway, New York 86 La Salle Street, Chicago

BRONCHO HARRY'S CINCH.

You kin bet thar wuz some talkin' on the Di'mun' Circle range
When that "tenderfoot from Boston" come among us fer a change;
Ev'ry feller in the outfit 'lowed they never saw a chap
Lackin' more uv cowboy git-up—lightnin' nerve an' fiery snap.
This here specimen from Boston wuz a most amusin' cuss,
An' the fellers winked an' snickered when he moseyed in on us,
An', in langwidge mighty proper, fer a chap uv twenty years,
Struck the boss, Hair-Trigger Johnson, fer a job at punchin' steers.

Frum his head clean to his bootheels, this here Boston cuss wuz dressed
In a way that's often pict'ered uv us fellers uv the west;
On his head wuz a sombrero, with a brim eight inches wide,
An' in which this eastern geezer seemed to take uncommon pride;
On his shirt an' down his breeches wuz some gaudy buckskin fringe,
Fer to give his outfit color an' a sort o' western tinge;
An' he wore a brace uv barkers strapped around his waist, to show
That he savvyed what wuz proper in the woolly west, you know.

Hair-Trigger Johnson wuz a chap 'twuz allers in fer fun,
Whether jest plain, common hoss-play er a circus with his gun;
An' he looked in sort o' pity down upon that Boston cuss,
Who stood gaupin' through his eyeglass, fust at Johnson, then at us;
While us fellers uv the outfit who wuz playin' "stud-hoss," we
Dropped our keerds an' cocked our ears an' listened quite attentively;
An' we reckoned if Hair-Trigger give the tenderfoot a chance,
We would hev a holy picnic through his Boston ignorance.

Feller didn't savvy nuthin' 'bout the duties of the range,
Yit, ez he wuz fresh frum Boston, we opined 'twuz nuthin' strange;
Never heered sich dum fool questions ez us fellers listened to—
Thought this locoed eastern maverick must hev sumhow slipped a screw.
Sed he'd "cotton mighty lively to a hoss if once astride;"
Reckoned he "could pitch a rope, er tie a steer an' shoot an' ride;"
An' the cuss appeared quite anxious fer to l'arn the business, so
We prevailed upon Hair-Trigger fer to give the kid a show.

When asked what he would tackle first, the Boston dude replied
That he reckoned, ez a starter, he hed orter l'arn to ride;
An' Hair-Trigger tol' the feller he hed made the proper lead,
An' if Barkis then wuz willin' that the circus would perceed.
Ev'ry feller wuz a-smilin', but the cuss he didn't swerve,
An' we come to the conclusion that the dude hed sand an' nerve;
Though we reckoned that when mounted on a bronc', there'd be a change
In the feelin's uv this maverick uv the Di'mun' circle range.

In the corral wuz a cayuse, which fer months hed long defied
Ev'ry effort uv the busters uv that neighborhood ter ride.
Wild ez any untamed critter, with a temper hot ez hell,
El Diablo on the ranges stood without a parallel;
An' Hair-Trigger Johnson chuckled, but he shook his head in doubt,
When the guy from Boston signaled fer to trot the critter out;
An' though all us chaps sed nuthin', yit we then an' thar opined
'Twould be safer far fer Boston if he'd up an' change his mind.

Bar-X Billy roped the cayuse, an' we cinched the sadde tight,
While the dude from Boston watched us, interested in the sight;
Then Hair-Trigger slipped the bit on, sayin' to him with a grin:
"If you've got yer prayers said, pardner, reckon that you'd best begin."
Then the "tenderfoot from Boston" buckled on his spurs, while we
Stood with anxious apprehension, wonderin' what his fate would be;
Yit, we couldn't help a-smilin', when a-thinkin' uv the trent
That would tickle all us fellers when he hit that saddle seat.

Say, you never seen a circus like us fellers witnessed there,
When that tenderfoot got settled an' the bronc' began ter r'ar!
El Diablo started buckin', but the feller smiled at us,
Diggin' in his spurs an' laffin' when we'd cheer the little cuss;
Then the bronc' got on his mettle, an' us fellers never heard
Sich a squealin' an' a gruntin', but the dude he never stirred—
Sot thar like a iron statue, rollin' uv a cigarette,
While our idees uv the feller somehow seemed to all upset!

We'd expected that the tenderfoot would be pitched in the air,
But the sandy little sinner simply sot a-grinnin' there—
Sot there through Diablo's tantrums jest ez calm ez calm could be,
In between the fracas yellin', "Well, what do ye think uv me?"
Then we heered Hair-Trigger holler: "Durn ye, stranger, what's yer name?
You're no ornery blank-blanked sucker at this 'ere rough-ridin' game!"
An' the tenderfoot he answered, when the bronco stopped ter rest:
"Some folks call me Bronco Harry; champeen rider uv the west!"

—E. A. Brininstool, in Sunset Magazine for March.

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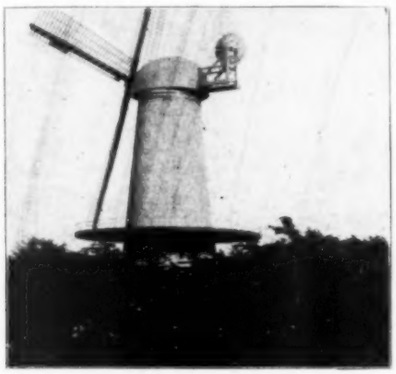
DUTCH WINDMILL A USEFUL CURIO.

An old-fashioned Dutch windmill, probably more remarkable than most of them to be found in Holland, the home of the windmill, stands in Golden Gate Park, San Francisco. It is located just south of the famous Cliff House and presents



Dutch Windmill, in San Francisco.

a picturesque appearance from whatever quarter it is viewed. This quaint looking machine is not merely an object of curiosity to please sight-seers, however. It combines utility with its attractiveness and is probably the most useful curio in the park. It supplies the park with fresh water.

STARCH AND THE FIRST STARCHER.

Originated with the Big Stiff Ruff—Favored by Royalty and Loathed by Puritans.

Starch originated in Flanders. It was introduced into England with the big ruff in the time of Queen Elizabeth. It was like our starch of today, except that it was made in colors—red, yellow, green, blue. The effect of this was to tint delicately the while linen to which the starch might be applied.

Before Queen Elizabeth's time ruffles and ruffs were made of fine Holland, which required no stiffening. Then the ruffs of cambric came, and these must of necessity be starched.

It is recorded that "when the Queen had ruffs made of lawn and cambric for her princely wearing there was none in England could tell how to starch them; but the Queen made special means for some women that could starch, and Mrs. Guilham, wife of the royal coachman, was the first starcher."

In 1564, a Flanders woman, Frau Van der Plasse, came to London and established there a school for the teaching of starching. The school succeeded. The Flanders frau got rich. She charged $25 a lesson, and an extra 20 shillings for a recipe for the making of starch out of wheat flour, bran and roots.

Yellow was the most fashionable color in starch among the nobility. The fast, racing set went in for green. The Puritans used blue starch, though at first they had been against the stuff altogether, dubbing it: "A certaine kinde of liquide matter which they call starch, wherein the devil hath willed them to wash and dive their ruffes, which, when they be dry, will then stand stiffe and inflexible about their necks."

Starch is made from wheat, corn and potatoes, and starving men have often subsisted on it, finding it nourishing though not tasty.

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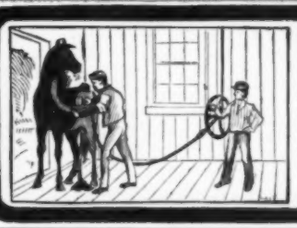

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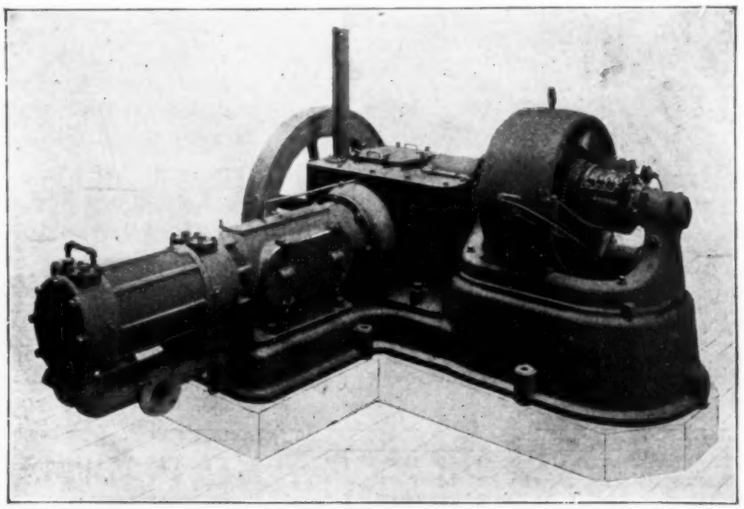

Motor Compressor.

It is proposed to hold an international exhibition at Liege, beginning April, 1905, to comprise artistic, scientific, industrial, commercial and colonial sections. The exhibition has received the patronage of King Leopold and has been promised the support of the Belgian government.

A BASHFUL MAN IN KANSAS.

Editor Popular Mechanics. Here is a good one:

A young man from Beloit came to Concordia one night last week to visit one of the fair maidens of this city and he spent the evening in her society very pleasantly. When it came time to take his departure he realized that a snow storm was raging. He had no umbrella or storm coat, and when the girl's parents asked him to remain at the house until morning he reluctantly consented.

He is a very bashful young man and next morning, when he was asked to take a seat at the table, he accepted, but was quite nervous and agitated. He sat opposite a mirror and to add to his horror he discovered that he had forgotten to comb his hair. Then he dropped his fork on the floor, and as he stopped to pick it up he upset his cup of coffee.

Matters went from bad to worse until in despair the young man quit eating, and put his hands under the table. The loose end of the tablecloth was lying in his lap and when he touched it he turned pale. He thought it was the nether end of his shirt and that in his nervous excitement while dressing he had forgotten to put the garment wholly inside his trousers. He thought that accounted for the smiles and stares of the family and his embarrassment. There was no time to lose, so he quickly stuffed the supposed garment inside his trousers and two minutes later when the family arose from the table there was a crash and the dishes lay in a broken mass upon the floor. The young man pulled three feet of the tablecloth out of his pantaloons, fled through the door and has not been seen or heard of since.

Louie C. Mathewson.

The friction which a current of air encounters increases with the length of the pipe or flue and with the temperature and decreases as the air is increased per unit of volume.

The largest cargo of Scotch coal ever shipped from the Clyde to San Francisco and the first for a number of years, has just arrived in a new sailing ship after a passage of five months and 3 days.

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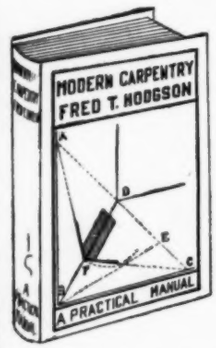
For Carpenters and Wood Workers Generally, By Fred T. Hodgson, Architect



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Over the vast establishment rules the captain in supreme and isolated authority, says Lieutenant-Commander Greaves, U. S. N., in the World's Work. All his accomplishments must be those of the seamen, for he directs the movements of the ship in all evolutions, and his decision upon all professional points is final. His responsibility at all times is grave and exacting. In time of war it will strain the stoutest nerves; in the hour of battle it is nothing short of appalling, when he stands alone in his conning-tower, having control of all the tremendous forces lying latent in his ship only to be released at the proper moment by a touch of his hand.

He is the guiding spirit of an enormous projectile of 15,000 tons that rushes through the water of a speed, it may be, of fifteen knots, and he knows that the slighest mistake of his head or heart may mean a national disaster.

But besides being the naval and military chief of the establishment, he is a lawyer—a kind of justice of the peace, as it were, who holds court every morning, investigates reports of misdemeanors and assigns punishment to the guilty. The delinquents are brought to the "mast"—the quarter-deck—with their accusers. Both sides are heard and swift judgment usually follows. In this capacity it will be noted that the captain is court, judge and jury. Not infrequently he acts as clergyman, and as such is the bishop of his diocese, acknowledging no ecclesiastical superior, reading the service on Sundays, officiating at the burial of his dead, and, in the old days, occasioning marrying lovers.

He always messes alone. His generous quarters are entirely separate from those of the other officers, and at the door of his cabin stands a marine sentry day and night, and none may enter without first being formally announced. When he comes on deck to leave the ship in uniform, or when he comes on board, he is escorted to the side by the executive officer and officer of the deck, the guard is paraded, four boys attend at the gangway, the bugler sounds the silence and every one on deck stands at attention as the boatswain pipes him cheerily over the side.

MANIA FOR PULLING TEETH.

The "tooth-pulling" mania is the latest infection and it has proven worse than the "hair-cutting", kissing, hugging, or other manias. A man by the name of Johnson went on a tooth-pulling expedition at Duluth, Minn., a few days ago and tried to "de-tooth" the town before he stopped. He started in by pulling the teeth of four men who were found intoxicated in a saloon. An hour later he accosted an old man on the street, knocked him down, and pulled two teeth. Fifteen minutes later he entered the residence of Mrs. Ellison, knocked her down, and extracted two teeth. The police in the meantime had been called and arrested him.

The man said he was a dentist, and when he was asked to show his license produced a contract to saw wood. He appears sane, but his actions indicate that he is mad.

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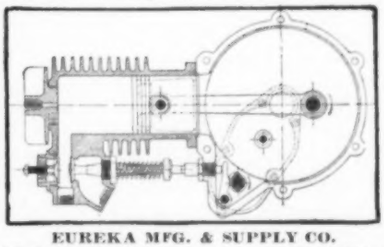

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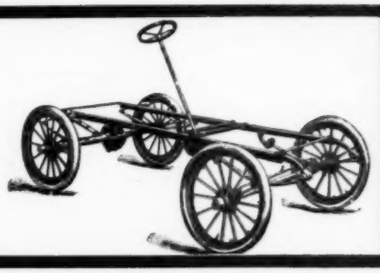

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